THE NUMERICAL SIMULATION OF PARTICULATE FLOW FOR BINGHAM VISCO-PLASTIC FLUIDS: A FICTITIOUS DOMAIN APPROACH

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We discuss the numerical simulation of the coupled flow/motion of mixtures of Bingham fluids and solid rigid particles. The computational method is based on a fictitious domain method with distributed Lagrange multiplier, time discretization by operator splitting, finite element approximations, and a wave-like equation treatment of the fluid advection. In contrast to the Newtonian case, the visco-plastic problem contains an additional difficulty related to the presence in the model of a nonsmooth operator (the sub-gradient of a nondifferentiable convex functional of the rate of strain tensor). To overcome this difficulty we take advantage of a characterization of the Bingham problem solution that involves a tensor-valued multiplier leading to an Uzawa-type algorithm with projection. We present the results of various numerical experiments.